

-18-

Claims

1. A regulation loop for a switching power converter of the type having a pulse width variable or pulse frequency variable modulator operating switches associated with a power source and a bridge filter section, with a power output node feeding a load, the variable parameter of the modulator establishing an amount of regulation and efficiency of the power converter, the bridge filter section having a first transfer function with inherent poles and zeros, the improvement comprising:

a comparator having a high impedance first input sampling a voltage or current from the power output node of the switching power converter as a first input signal and having a second input signal from a reference supply representing a target voltage or current level for the load, the comparator having an output signal on an output line with a high or low signal depending on whether first input signal exceeds the second input signal or not; and

a filter connected to the comparator receiving the comparator output signal and to deliver a filter output signal, the filter having a second order transfer function, the second order transfer function established by a selection of filter components offsetting the poles and zeros of the first transfer function, whereby the filter output signal is smooth, operating the variable input parameter of the pulse width variable or pulse frequency variable modulator.

2. The apparatus of claim 1 wherein a charge pump is interposed between the comparator and the filter.

-19-

3. The apparatus of claim 2 wherein the filter comprises at least one capacitor in communication with the charge pump, whereby the charge pump adds and subtracts charge from the capacitor.

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4. The apparatus of claim 2 wherein the filter comprises at least two capacitors in communication with the charge pump, whereby the charge pump adds and subtracts charge from the capacitor.

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5. The apparatus of claim 2 wherein the filter comprises two parallel branches having opposed ends, including a first end connected to the charge pump and a second end connected to ground.

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6. The apparatus of claim 5 wherein a first branch of the filter comprises a capacitor.

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7. The apparatus of claim 5 wherein a second branch of the filter comprises a capacitor and a resistor.

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8. The apparatus of claim 2 wherein the charge pump comprises switch means for injecting and retracting current from the filter.

-20-

9. A regulation loop for a switching power converter of the type having a pulse width variable or pulse frequency variable modulator operating switches associated with a power source and a bridge filter section, with a power output node feeding a load, the variable parameter of the modulator establishing an amount of regulation and efficiency of the power converter, the improvement comprising:

a comparator having a high impedance first input sampling a voltage or current from the power output node of the switching power converter as a first input signal and having a second input signal from a reference supply representing a target voltage or current level for the load, the comparator having an output signal on an output line with a high or low signal depending on whether first input signal exceeds the second input signal or not;

a charge pump connected to receive the output signal from the comparator and either source or sink current in response thereto as a current signal; and

a filter connected to the comparator receiving the current signal and delivering a filter output signal operating a pulse width variable or pulse frequency variable modulator.

10. The apparatus of claim 9 wherein the filter comprises at least one capacitor in communication with the charge pump, whereby the charge pump adds and subtracts charge from the capacitor.

-21-

11. The apparatus of claim 9 wherein the filter comprises at least two capacitors in communication with the charge pump, whereby the charge pump adds and subtracts charge from the capacitor.

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12. The apparatus of claim 9 wherein the filter comprises two parallel branches having opposed ends, including a first end connected to the charge pump and a second end connected to ground.

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13. The apparatus of claim 12 wherein a first branch of the filter comprises a capacitor.

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14. The apparatus of claim 12 wherein a second branch of the filter comprises a capacitor and a resistor.

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15. The apparatus of claim 9 wherein the charge pump comprises an inverter arrangement of MOS transistors, with a pair of bias transistors connected to the inverter arrangement.